

[Document's Name] Patent Application

[Reference Number] 98-00333

[Submitting Date] March 31, 1998

[Destination] To the Commissioner of the J.P.O.

[Int. Cl] G06F 17/30

[Title of the Invention] ELECTRONIC BOOK DISPLAYING DEVICE AND
STORAGE MEDIUM READABLE BY COMPUTER

[Number of the Invention] 12

[Inventor]

[Domicile] c/o SHARP KABUSHIKI KAISHA
22-22, Nagaike-cho, Abeno-ku, Osaka-shi,
Osaka

[Name] Yuji SAWADA

[Inventor]

[Domicile] c/o SHARP KABUSHIKI KAISHA
22-22, Nagaike-cho, Abeno-ku, Osaka-shi,
Osaka

[Name] Shigeki KUGA

[Applicant for Patent]

[Identification Number] 000005049

[Zip code] 545

[Domicile] 22-22, Nagaike-cho, Abeno-ku, Osaka-shi,
Osaka

[Name] SHARP KABUSHIKI KAISHA

[Representative] Haruo TSUJI

[Telephone Number] 06-621-1221

[Attorney]

[Identification Number] 100096622
[Zip code] 545
[Domicile] c/o SHARP KABUSHIKI KAISHA
22-22, Nagaike-cho, Abeno-ku, Osaka-shi,
Osaka

[Patent Attorney]

[Name] Masaru UMEDA
[Telephone Number] 06-621-1221
[Appointment] TEL. 043-299-8466
Intellectual Property Division-Tokyo
Office

[Indication of a fee]

[Prepayment Register Number] 012313
[The amount of payment] 21,000 YEN

[List of the objects filed]

[Name of the object]	Specification	1
[Name of the object]	Drawings	1
[Name of the object]	Abstract	1

[General Power of Attorney No.] 9703282

[Document Name] Specification

[Title of the Invention]

ELECTRONIC BOOK DISPLAYING DEVICE AND STORAGE MEDIUM READABLE
BY COMPUTER

[Claims]

[Claim 1] An electronic book displaying device comprising a storage means with a record of book data, a display means for displaying the book data recorded on the storage means and a page turning means for turning pages of the book data displayed on the display means, characterized in that it is further provided with an environment managing means for managing information for user's reading environment, a second storage means for recording a different viewpoint scene data obtainable by viewing the displayed book data from different view point or mental image data distinguishing the different viewpoint scene data visually, a mental image outputting means and a reading effect control means for outputting reading effect data produced by using the different viewpoint scene data and the mental image data.

[Claim 2] An electronic book displaying device as defined in claim 1, characterized in that the reading effect control means, prior to outputting reading effect data to display means or the mental image outputting means, controls outputting the reading effect data by referring to user's reading environmental information stored in the environment managing means.

[Claim 3] An electronic book displaying device as defined in claim 1 or 2, characterized in that the reading effect control means outputs the reading effect data after a partial or whole book data area corresponding to a mental image data is displayed on the display means.

[Claim 4] An electronic book displaying device as defined in any one of claims 1 to 3, characterized in that the reading effect control means outputs the reading effect data after the elapse of time specified by a time switching mode in book data.

[Claim 5] An electronic book displaying device as defined in any one of claims 1 to 4, characterized in that the reading effect control means controls time or a method of outputting the reading effect data by using display mode values preset for respective book data areas into which the book data is divided according to a content or format.

[Claim 6] An electronic book displaying device as defined in any one of claims 1 to 5, characterized in that the reading effect control means outputs reading effect data by using a reading effect table or a relation graph defining correlation between the reading effect data and reading environment information consisting of user information and psychological information or reading information.

[Claim 7] An electronic book displaying device as defined in any one of claims 1 to 6, characterized in that the reading effect control means changes a level of outputting mental image data in a range from a zero to a maximal value in proportion

with a psychological value being integrated environmental information of a reader's psychological state.

[Claim 8] An electronic book displaying device as defined in any one of claims 1 to 7, characterized in that the reading effect control means outputs mental image data in proportion with an amount of page turning motion.

[Claim 9] An electronic book displaying device as defined in any one of claims 1 to 8, characterized in that the reading effect control means outputs mental image data with corresponding reading effect data superposed thereon when a page contains plural book data areas corresponding to mental image data.

[Claim 10] An electronic book displaying device as defined in any one of claims 1 to 9, characterized in that the reading effect control means stops outputting a part or whole of reading effect data.

[Claim 11] An electronic book displaying device as defined in any one of claims 1 to 10, characterized in that a control method of the reading effect control means can be changed by a user.

[Claim 12] A data storage medium containing a record of book data display program readable by a computer to realize a book data storing function, a display function for displaying stored book data, a page turning function for turning a book data page being displayed on the display means, a environment information managing function for managing information about reader's reading environment, a second storing function for storing a

different viewpoint scene data obtainable by viewing the displayed book data from different viewpoint or mental image data, a mental image outputting means and a reading effect control means for outputting reading effect data produced by synthesizing the different viewpoint scene data with the mental image data.

[Detailed Description of the invention]

[0001]

[Technical Field to which the Invention Pertains]

The present invention relates to an electronic book displaying device for reading and displaying electronic book data stored on storage medium.

[0002]

[Prior Art]

Another example of an electronic book device is disclosed in Japanese Laid-Open Patent Publication No.63-15796, which comprises an external storage medium with recoded thereon data (characters, numerals, symbols) in the form of coded signals, a document data recorded data reproducing device, a flat displaying device, an external inputting keyboard, a character memory and a thin portable type book device including a micro computer (an electronic book displaying device for the present invention). In this device, data recorded on the external storage medium is reproduced by the reproducing device and a page (i.e., screenful) consisting of characters, digits and symbols is displayed on a flat screen by the micro computer,

which is read by a user (reader). The above publication also describes a portable book device that reproduces a plurality of screenfuls of data and temporarily stores the screenfuls on the temporary memory. The user can display on a display screen any page specified through the external keyboard. Thus, the user can read the desired page displayed on a screen. The above art allows the user to bring the next page on the screen by pressing a button "next page" just like he or she turns a page of a paper book.

[0003]

Japanese Laid-Open Patent Publication No. 8-249344 discloses an art relating to an electronic book device that comprises a storage medium with recoded thereon book data, a displaying means for reading the book data from the storage medium and displaying the data on a screen and a page transmitting means for tactually informing the user of the page position by vibration. Namely, the page transmitting means is a generator for generating vibration with frequencies corresponding to respective page positions. That is, the art concerns the electronic book device that generates vibration whose frequency increases or decreases as the page number increases or decreases or has a specified value at a specified page. This enables the user to recognize a relative position of a current page among the whole pages of the book by his or her tactual sense. The art allows a user to tactually retrieve any desirable page by try and error method.

[0004]

Japanese Laid-Open Patent Publication No.5-224582 discloses an art relating to a drama reproducing device that comprises a display for displaying soundless images in succession, an image sound storage for storing input images and accompanying sounds, a sound selecting device for selecting respective sound signals adapted to the respective images and a sound attaching device for attaching the selected sounds to corresponding images.

The device can reproduce the drama with accompanying sounds. The same art describes that a drama is selected according to user's age, mental age or the purpose of the drama. For the user being a little child, a drama containing a simple usual conversation, living environmental sound and animals' voices, etc. may be selected. For school children, a drama containing human document or developing through discussions may be selected. The art can give pleasure to users by presenting a drama containing selected images and sounds.

[0005]

Furthermore, there is a widely known technique concerning home pages of Internet World Wide Web (WWW), which realizes outputting a changed message or a changed background by a user for a time of accessing a desired home page or automatically switching over to another home page at a certain time elapsed after the access.

[0006]

[Problems to be solves by the Invention]

The above described conventional electronic book displaying device can output to a displaying device or sound output device only book data, image data and narrative sound data and cannot increase the pleasure of reading the book with the additional desirable effect that may be created by multimedia information including vibration.

[0007]

The above conventional electronic book displaying device has no function for sensing a mental state of a user and cannot output images and sounds, which can more increase the pleasure of reading with consideration of the user's mental state.

[0008]

The same conventional device is adapted for an editor to create a drama with sound by selecting images from plural images from a point of the editor's view and adding sound data thereto. It has no function to correspond plural images to a specified scene and produce sound data adequate to respective images. Consequently, a considerable large load is put on selection of images from the editor's point of view and addition of sound signals to the selected images.

[0009]

The same device has no function to know information such as reader's history and cannot therefore change a content of book data to be output according to the number of reading times. In summary, it cannot facilitate the reader to do fresh reading.

[0010]

The same device has no function to adjust a reading speed according to information about a reader and the content of the book and cannot therefore allow the reader to read a book rapidly or slowly.

[0011]

The same device is intended to improve the understanding of data (drama) of a book and cannot provide a function to present subliminal visual and sound information for a very short time in mixture with document data in order to increase the general effect of reading, develop the potentiality of the reader and provide psychotherapeutic and educational effects.

[0012]

The same device can reproduce the same vibration or sound every time when related data of a book is reproduced. Repeating the same information cannot promote the reader's interest and understanding.

[0013]

The same device has fixed output levels of vibration and sound information. It cannot gradually vary the output level of, e.g., fade in or fade out sound information to increase the reading effect.

[0014]

The same device has no function to determine a relation between a position and a time of outputting book data related vibration or sound information on a display means and cannot

therefore vary the output in accord with the action or interlocking motion of the reader to increase the reading effect.

[0015]

The same device has no function to control the output in the presence of plurality of vibration or sound data related to book data in the same page or the same window. Therefore, it cannot produce a harmonized sound from plural sound data to enhance the reading effect.

[0016]

Accordingly, another object of the present invention is to provide an electronic book displaying device that has a means for capturing and managing information such as a reader's mental state and reading state and, when book data concerning reading effect data is displayed on a display means, can easily output multimedia reading effect data adapted to the reader's reading information to increase a general effect of reading and improve psychological and educational effects.

[0017]

[Means for solving Problem]

An electronic book displaying device according to the present invention (claim 1 to claim 11) comprises a storage means with a record of book data, a display means for displaying the book data stored in the storage data, a page turning means for turning a current page (screenful) of the book data to next one on a display screen and is featured by further including

an environment control means for controlling the information about user's reading conditions, a second storage means for storing image data being a different viewpoint representation of the book data being displayed on the display screen or storing mental image data distinguishing the different viewpoint scene data visually, a mental image outputting means for outputting mental image data and a reading effect control means for controlling reading effect data produced by using the different viewpoint scene data and the mental image data.

[0018]

The above reading effect control means can control the reading effect data referring to the user's reading conditions stored in the environment control means before outputting the data to the display means or the mental image outputting means. The reading effect control means can output the reading effect data after displaying on the display means a whole or partial book data area correlated with the mental image data.

The reading effect control means can also output the reading effect data after a certain period specified by a time switching mode for changing the presentation time of the book data.

[0019]

The reading effect control means can control a time or a method of outputting the reading effect data according to display mode values preset for each of areas into which the book data are divided based on the content or format of the book data. The reading effect control means can produce and

output the reading effect data by using a reading effect table or related graph for determining the correspondence of the reading effect data to reading environmental information consisting of user's information and user's mental state or reading information. The reading effect control means can also change a mental image data output level in a range from 0 to a maximal value in proportion to a mentality level determined by synthesizing the user's mental state information. The reading effect control means can further output the mental image data proportional to an amount of motion of turning pages by the user.

[0020]

Furthermore, in case of coexistence of plural book data areas corresponding to the mental image data on the same page (screenful), the reading effect control means can output the reading effect data corresponding to each mental image data for each area. The reading effect control means can also stop outputting a whole or a part of the reading effect data. It is also possible for the user to change the control method of the reading effect control means.

[0021]

A storage medium containing a program readable by a computer, which is provided by the present invention (claim 12), is performed by a computer to realize a book data storage function, a stored book data displaying function, a page turning function for turning pages of the book data being displayed, an

environment information control function for managing information of the reader's conditions, a second storage function of recording different viewpoint scene data or mental image data, a mental image data outputting function and a function of synthesizing the different viewpoint scene data with the mental image data to produce and output reading effect data for increasing the effect of reading the book data being displayed on a display screen.

[0022]

The above described system structure according to the present invention can output the reading effect data in accord with the reader's reading conditions, thus providing the user with the reading effect that cannot be received from usual reading. This may contribute to easy understanding, increasing mental effect and improving educational effect.

[0023]

[Modes of carrying out the Invention]

Fig. 1 is a block diagram of an electronic book displaying device according to an aspect of the present invention. Numeral 1 designates a storage means that may be any of magnetic storage media such as FD, MO and CD and/or LSI media such as IC card, smart media. The storage means 1 stores book data, and processing program for controlling device and various kinds of necessary data. Numeral 2 denotes a display means for displaying the book data and other information on its display screen and may be a liquid crystal display (LCD), CRT or plasma

display. Numeral 3 designates a page turning means that may be a button or cursor and can turn pages (images) of book data in a forward or reverse direction on the display screen of the display means. The page turning means includes functions for scrolling lines, turning pages by a cursor, changing a data image to a different viewpoint scene.

[0024]

Numeral 4 designates an environment managing means for sensing information relevant to a psychological state of a reader and reading environments and managing the information. Numeral 5 denotes a second storage means for storing different viewpoint scene data or mental image data, which will be described later in detail. The second storage means may be of the same type as the storage means 1. The second storage means may be common with the storage means 1. Hence, the second storage means will be described hereinafter as integrated in the storage means 1 unless otherwise specified. Numeral 6 designates an output means for outputting the mental image data accumulated in the second storage means. The output means outputs sound signals through a speaker means, vibration from an oscillator and a deformed image.

[0025]

Numeral 7 denotes a control means that can produce reading effect data desired by the user for the book data displayed on the display means according to user's specific environment managing information stored in the environment managing means

and controls the reading effect data to output to the display means or mental image output means. This means may be replaced by a central processing unit (CPU).

[0026]

Fig. 2 shows an external appearance of an electronic book displaying device that is a representative embodiment of the present invention. In Fig. 2, numeral 2 designates a display means that was described above with reference to Fig. 1. Indication means 21(a) and 21(b) are used by the user for instructing to turn a page and a selector button 22 is used by the user to change a screen image to another when different viewpoint scene data consisting of plural images was added to a single page. A cursor key 23 is used for moving a cursor on an image screen of the display means. The components 21(a), 21(b), 22 and 23 composes the page turning means shown in Fig. 1.

[0027]

Sound output means 24(a) and 24(b) that is an exemplary mental image output means and constructed from small type speakers. Although the device shown in Fig. 2 has two speakers, it may have one or three (or more) speakers. The number of speakers has no effect on the embodiment of the present invention. However, the provision of plural speakers is desirable for increasing the reading effect since the two speakers can output stereo sound or three speakers can create deep stereo sound. In Fig. 2, the electronic book displaying

device outputs voice or sound through speakers mounted thereon. The sound output means may be external speakers, earphones or a headset, which are connected to plug sockets provided on the device body.

[0028]

Numeral 25 designates a temperature sensor for measuring the user's hand temperature and numeral 26 designates a humidity sensor for sensing sweat on fingers of the user. The temperature sensor and the humidity sensor can be integrated into a single unit as shown in Fig. 2. Numeral 27 is a heartbeat sensor for measuring user's heart rate. Numeral 28 is a slot for insertion of a storage means with book data recorded thereon.

[0029]

The electronic book displaying device incorporates a vibrating means 29. Book data or image processed book data to be output onto the display means, voice and sound to be output through the sound output means and vibration to be output by the oscillating means may independently or cooperatively composes mental image data.

[0030]

The arrangement of the above page turning means, sound output means, heart rate meter, temperature sensor and humidity sensor are not restricted to those shown in Fig. 2. However, the temperature/humidity sensor must be disposed on the side or bottom surface of the device body so that the user may touch

the sensor while keeping in hand the device. The display means 2 may be a LCD having a tablet function that allows the user to designate a cursor location with a pen on its display screen instead of the cursor key 23.

[0031]

Figures 3(a) and 3(b) show summaries of a format of book data to be recorded on a storage means. Fig. 3(a) shows two formats of book data: the example shown on the left side is for a storage device having a structure of book data of a usual electronic book display and the example shown on the right side is for the second storage device featuring the present invention in the case two storages have different data structures. Numeral 30 designates book data that is disposed in one unit on each page. Each page is provided with a pointer 31 to the second storage device. Each pointer points a second storage address wherein a different viewpoint scene data (representing the same page image viewed from a different viewpoint) or mental image data 32 of each book data page is stored. The different viewpoint scene data or mental image data in the second storage device may have different data units for each page as shown in Fig. 3(a).

[0032]

Fig. 3(b) shows a data structure of a storage in which the storage device and the second storage device are integrated together. As shown in the data format 33, pointers are omitted and book data, different viewpoint scene data and mental data

are subsequently arranged for each page.

[0033]

Fig. 4 shows an exemplary data format for one page of book data. Since a book data and a different viewpoint scene data are replaceable by each other, both screen data are dealt with as the same screen data as shown in Fig. 4. Generally, screen 1 is book data shown in Fig. 3, screen 2 and screen data thereafter are different viewpoint scene data and so on.

[0034]

Each page has a field 40 storing the number of screens (book data screens plus different viewpoint scenes), a field 41 storing the number of areas into which each page is divided according to the data format or contents, and fields thereafter for settings necessary for processing each area of each screen. Areas of the screen 1 will be described by way of example in detail.

[0035]

A field 42 stores an identifier of changing a scene of the area 1 as shown Fig. 4. The identifier has a classification code: code value 0x00 means changing a scene to another by time and code value 0x01 means changing a scene to another by pressing a button.

[0036]

The field 42 with the identifier 0x00 is followed by a field 43 in which a scene changing mode for deciding how to set time for changing the scene. The scene time switching mode is

selectable to set time proportional to a distance from a starting point of book data displayed on the display means to this area or time proportional to visual reading time from a starting point of book data displayed on the display means to this area or time specified on a timer. When the time set in the field elapsed, the scene is automatically changed to a scene specified by reading environment information.

[0037]

It is possible not to change a scene to a specific scene by setting the time to infinity or not to present a preceding changeable scene by setting the time to zero.

[0038]

A field 44 stores a scene number of the area 1, which is referred to by this number when exchanging information. A field 45 stores one, two and three dimensional coordinates values data of scene data of the area 1. A field 46 stores an identifier of a format of the area 1. The identifier has a classification code (Fig. 4): code value 0x00 indicates that the area 1 is described by character strings. The format is not restricted to the above description.

[0039]

A field 47 stores a description of scene data of the area 1 and a field 48 stores a description of a display mode of the area 1. The display mode allows the user to set a display method (e.g., progressive display, blinking, normal display) or display time. In field 47 pointer indicating area where file

name and screen data are stored can be used.

[0040]

A field 49 stores an identifier of changing a scene for an area 2 of the screen 1. Fields after the field 49 store values of the area 2 corresponding to the fields 43-48 for area 1. Values are accumulated by the number of areas, which is preset in the field 41. A field 4a stores the number of book data areas 2 and thereafter, in which values described with reference to the screen 1 are accumulated by the number of images, which is set in the field 40.

[0041]

Fig. 5 shows an exemplary format of mental (mind) image data for a page. As shown in Fig. 5, a field 50 storing the number of mind image data areas (reading effect marks) added to the page is followed by fields 51 to 5n (by the number of the mind image data areas) in which respective parameters relevant to the mental image data are stored.

[0042]

The mind image data for each areas (51-5n) includes field (51a-5na) storing a mind image data area number identifying a mind data area in a page, a field (51b-5nb) storing information on a location of a mental image data area and a field (51c-5nc) storing the number of mental image data added to an area.

[0043]

Fields (51d, 51g...) store identifiers specifying types of

mind image data by the number of the mind image data. Fields (51e, 51h...) store mind image data outputting methods by the number of the mind image data. Fields (51f, 51i...) store mind image data or mind image data producing methods by the number of the mental image data.

[0044]

The mental image data identifiers (51d, 51g...) are described by numerical values like Fig. 5, e.g., the identifier 0x00 indicates that the mental image data is used for image processing. A type of image processing with deformation, which is made on image data of a specified area of a different viewpoint area or specified book data, and parameters necessary for conducting the image processing are set in the above fields.

[0045]

With the mental image data identifier 51d having a value 0x01, the mental image data to be stored in the mental data field 51f is vibration relevant data. Consequently, vibration parameters such as vibration frequency, time and amplitude necessary for driving a vibration generating oscillator in the mental image output means are set and stored therein. Similarly, when the mental image data identifier 51d has a value 0x02, effect data to be stored in the field 51f is voice data and parameters such as man voice or woman voice, loudness and other vocal sound features are set and stored therein.

[0046]

In the above case, the mental image data is directly stored

in the fields but is not restricted to this. It is also possible to store in this field a pointer to an area in which data is stores or a name of a file storing the data. An object to be pointed by the pointer may be a reference table for mental image data.

[0047]

The mental image output identifiers (51e, 51h...) store flags for deciding whether to automatically output mental image data or to manually output the mental image data by specifying an area by using a cursor key 2 (by a user) when a book data area to which the mental image data is related (this area may be referred hereinafter to as a reading mark or a mental image data area) is displayed on the display means.

[0048]

Fig. 6 shows an exemplary data structure of reading environment information to be managed by the environment managing means. The reading environment information consists generally of psychological state related information (psychological information), reading state related information (reading information) and user's information.

[0049]

A field 60 contains heart rate data, a field 61 contains body temperature data (temperature at fingertips) and a field 62 contains a humidity data (sweat from fingertips). The heart rate, body temperature and humidity are current time output of the temperature sensor 25, humidity sensor 26 and heart rate

meter 27, which have been described before with reference to Fig. 2. The information 60 to 62 composes user's psychological information. It is apparent that the psychological information is not restricted to the above three kinds and may be varied by using other kinds of sensors.

[0050]

An exited state can be represented by high value of the above 3 kinds of psychological information. Expressing the heart rate, body temperature and finger sweat in a normal state of a person by S_0 , T_0 and Y_0 and their value at time t by S_t , T_t and Y_t respectively, a psychological degree K_t representing a psychological state of the user at time t can has the following approximated expression:

$$K_t = a_1(S_t - S_0) + a_2(T_t - T_0) + a_3(Y_t - Y_0)$$

where a_1 , a_2 and a_3 are proportional constants. However, relational functions are not limited to the above linear expression and they may be those indicating relations to the heart rate, body temperature and finger humidity.

[0051]

A field 63 stores date of reading, a field 64 stores the time at which the user started the reading, a field 65 stores a room temperature when the user started reading, a field 66 stores humidity in the room when the user started reading and a field 67 stores reader' history information. The values 66 and 65 are obtained from the temperature sensor 25 and the humidity sensor 26 just after switching on the electronic book

displaying device and before being touched by the user.

[0052]

The reader's history information stores how many times the user has read the objective portion of book data. The reader's history information can manage the data on the basis of each page of the book data or the different viewpoint scene data. A field 68 stores an average speed (interval) of turning pages, which value is determined according to the page turning intervals measured by a timer incorporated in the CPU or the reading effect control means. The field 67 may store pointers indicating respective areas containing the data. Fields 63-68 are used for storing the above described reader's history information.

[0053]

A field 69 stores the reader's name, a field 6a stores the user's age and a field 6b stores the user's sex. A field 6c stores the user's purpose and a field 6d stores the user's taste. Once the user's name was inputted, the reader's history information 67 can be managed by the user's name. The user's purpose 6c can be set through a user's interface and selected in accord with the operation modes of the electronic book displaying device, e.g., quick reading mode, learning mode, latent power developing mode, relaxation mode, sentiment cultivation mode and so on. The user's taste 6d includes user's taste information, e.g., taste for classic music or pops music, light tone screen or strong tone screen and calmness or

excitement.

[0054]

Fig. 7 is a flowchart depicting an example of the operation of the reading effect control means according to the present invention. Step S10 is a processing module for reading necessary initialized data, book data, different viewpoint scene data and mental image data into the reading effect control means. Step S11 is a processing module for transferring display data of a corresponding page from the reading effect control means into a display buffer and display the data. The acquisition of the initialized data includes reading the outputs of the temperature sensor 25 and the humidity sensor 26 into the fields 65 and 66 (for room temperature and humidity) of the reading environment information (Fig. 6) and reading the date and time from a calendar or timer (incorporated in the CPU or reading effect control means) into the fields 63 (date) and 64 (time) for the reading environment information. A page to be displayed is set as a default vale unless otherwise specified. For example, the default is set to open an initial page or a page that was finally open at the last time.

[0055]

Step S12 is a processing module for examine whether a reading effect mark is on the displayed page. When no mark is found (that is, no need for increasing the reading effect), the process proceeds to the next processing module for discriminating whether to display the next page or to finish

the processing. When the reading effect mark was found at one or more places on the page being displayed, the following processing is conducted.

[0056]

Step S13 is a processing module for reading the reading environment information into the reading effect control means. Psychological information data included in the environment managing information is updated first in stable state, e.g., 5 minutes after the beginning (date and time) of the reading and periodically thereafter at a constant interval of, e.g., 1 minute or every time when turning a page (opening the next page). The reader's history information 67 (Fig. 6) includes records of accessing to each page of the book data or each area of the different viewpoint scene data. The user's information (Fig. 6) includes values preset by the user through the user's interface.

[0057]

Step S14 is a processing module for creating the reading effect data using the above reading environment information. The meaning of "increasing the reading effect" according to the present invention is to supply the user with optimal image, voice and sound, vibration in accord with user's feeling, excitement state degree, taste, purpose or reader's history. Among the psychological information, reading information and user's information, which are stored in the environment managing means of Fig. 6, suitable mental image data and

different viewpoint scene data are selected using an effect data table (to be described later) or related graphs and, then, synthesized to realize the above purpose. This will be described in detail later.

[0058]

Step S15 is a processing module for outputting the above produced reading effect data. The reading effect control means refers first to the code value of the identifier 42 for changing a screen image of the book data. With the identifier 0x00, the reading effect control means refers to the timer mode field 43 and decides the time to output image data 47 of this area and mental image data added to that area. The reading effect control means then output the reading effect data to the display means or the mental image output means. The mental image data is output at the timing synchronized with outputting of the different viewpoint scene data. This will be described in detail later.

[0059]

Step S16 is a processing module for examining whether display of the next page is requested or not. When the next page is requested, the preparation for displaying the next page is performed (Step S18). With no request, the processing is finished (Step S17).

[0060]

Fig. 8 shows an example of a specified page being displayed on the display means. As shown in Fig. 8, the page is divided

into three areas 1(80), 2(81) and 3(82). The area 3 is an illustration area wherein a photo of Japanese National Park "Nara" is presented. The whole area 3 is marked with a reading effect mark (with a frame as shown in Fig. 8) to distinguish from the other areas. In Fig. 8, the area 3 is surrounded by a framing line that is not displayed in practice. The area 3 is given a reading effect mark that is distinct from the other area.

[0061]

The screen image of Fig. 8 is displayed by bringing images from a preceding page or a proceeding page by pressing page turning means 21a or 21b. In this case, the screen image is changed on page by page basis. Therefore, the entire area 3 is displayed substantially at the same time with the other area images. It is also possible to continuously turn pages by scrolling the screen image line by line by using the cursor key 23. For example, in case of turning a page by reverse scrolling, it is possible to conduct the line by line scroll of the image from the state in which a top end of the area 3 is positioned at the top end of the screen to the state in which the top end of the area 3 is positioned at the bottom end of the screen. Therefore, when the image data is displayed (Step S11), the reading effect control means can recognize the presence of mental image data by examining the existence of any one of the framing lines of the reading effect mark on the display means (Step S12).

[0062]

Fig. 9 is a view for explaining an exemplary timer mode for deciding the timing of outputting the reading effect data in Step S15 (claim 4). Referring to the same screen image of Fig. 8 with the same reference numerals, the operation is described as follows: Numeral 90 designates a distance r from a starting point of the screen to a starting point of an area to which mental image data pertains. When the diagonal of the screen image has a distance s , the user usually starts reading a displayed image from the starting point and ends the reading at a right bottom point of the screen. Now let assume that time T_f is necessary for reading screen data from the starting point to the end point and no difference exists between time lengths reading three areas. In this case, the user starts reading the area 3 at time $T_r = T_f \times r/s$.

One of screen time switching modes according to the present invention (claim 4) is as follows: When time T_r elapsed after display of a part or a whole of book data to which mental image data pertains, the photo of the Nara Park is changed to a photo showing a deer on a hill. While a book data area with plural different viewpoint scene added thereto is read, a different viewpoint scene can be replaced by another different viewpoint scene. In this case, mental image data is also output if it is added to the different viewpoint scene data to be displayed. This output mode is called visual distance mode.

[0063]

Another scene time switching mode considers time for visualizing each area. For example, the area 1 contains character strings that can be read at a rate of time T_c per character and the area 2 also contains character strings that can be read at a rate of T_{c2} per character. In this case, the user starts reading the area 3 at time T_m .

$$T_m = T_{c1}X_{m1} + T_{c2}X_{m2}$$

where m_1 is the number of characters in the area 1 and m_2 is the number of characters in the area 2. Similarly to the above case, when time T_m elapsed after display of a part or a whole of book data to which mental image data pertains, the photo of the Nara Park is changed to a photo showing a deer on a hill. This outputting mode is called visualization mode.

[0064]

In the timer mode, it is possible to set time not directly relating to the time at which one starts reading an objective area. For example, the photo of a deer on a hill can be displayed before the user could visually recognize the photo of the Nara Park by setting the changing time to zero. In this case, the user cannot recognize the photo of the park and can feel the photo of a deer directly appears on the screen.

[0065]

In Step S15, the reading effect control means refers to the time switching mode field for each area of displayed book data (screen data), recognizes the distance mode or visualization mode or timer mode, determines the display waiting time

predetermined for the mode and outputs the reading effect data when the waiting time passed.

[0066]

Display modes to which reference is made in claim 4 before performing display of image data by the time switching mode will be described regarding the processing module Step S15 (claim 5). When a part or the whole of mental image data was displayed on the display means, the reading effect control means refers to a value of the display mode in the book data being displayed. Fig. 10 shows an exemplary data structure for the display mode. A field 100 stores the display method. With a code value 0x00 of the display method, a selected different viewpoint scene data is displayed gradually increasing its sharpness (in the progressive mode). With a code value 0x01, the usual (normal) display is obtained. Other codes are prepared for blinking display, inverse and flash so on. A care shall be taken not to confuse the field 100 with the image processing data in the mental image data identifier 51d of Fig. 5. The image processing data is accompanied by deformation of a display image whilst the field 100 does not cause an image to be deformed. A field 101 stores the time for which a different viewpoint scene data is displayed. The data is displayed for the time preset in this data field. A field 102 defines a processing method applied when the display time exceeds that preset in the field 101. With a code value 0x00 in the field 102, the display returns to the preceding image after

displaying the different viewpoint scene data for the preset time. With a code value 0x01, a scene number in the field 44 of Fig. 4 is designated and the designated image data is then displayed. With a code value 0x02, the display is changed to another different viewpoint scene data whose scene number is larger than by 1 that of the current image data.

[0067]

An example of the processing relevant to Step S14 is described below (claim 6). Having referred to the reading environment information in Step S13, the reading effect control means refers now to the reading effect table. Fig. 11 shows an example of the reading effect table showing the relationship between the reading effect data to be output and the reading environment information. In Fig. 11, values of heart rate 60 are shown in divided ranges of 6a1 to 6an on the horizontal axis (in rows) and values of sweat 62 on a fingertip are shown in divided ranges of 6b1 to 6bm on the vertical axis (in columns). Reading effect data 6d11-6dmn to be output can be designated in corresponding cross cells between heart rate value divisions and sweat value divisions. For example, the reading effect control means reads the reading effect table accumulated in the second storage means and refers to the reading environment information. When the heart rate value and the sweat value stored in the environment managing means 4 are in the ranges 6a2 and 6b1 respectively, the reading effect control means selects the reading effect data 6d12 in the reading effect table,

which data corresponds to the above heart rate and sweat values. The selected reading effect data is then output to the mental image data output means or the display means.

[0068]

The table shown in Fig. 11 is organized as a two dimensional table for the heart rate and the sweat but it is usually expanded to an n-dimensional table. The reading environment information stored in the environment managing means 4 is shown in Fig. 6. The items shown therein are managed in respective tables. The reading effect data 6d11 to 6dmn may be, not actual data, but file names or pointers showing locations of actual data.

[0069]

The reading effect control means first compares each field value of the reading environment information with each value of n-dimensional axis of the reading effect table. Next, the reading effect control means refers to a value in a cell found at a cross point of the two corresponding cells, determines the type and the output level of the mental image data or the different viewpoint scene data to be output and generates reading effect data to be output.

[0070]

Figures 12(a), 12(b) and 12(c) show respective graphs for explaining another aspect of the reading effect control means (claim 7). Different from the above described embodiment (claim 6) wherein the reading effect data is matched to a range of psychological information values, the present embodiment

(claim 7) decides the type and the output level of mental image data according to the relevant graphs showing the relationship between the psychological state level defined by synthesis of psychological information and the mental image data to be output (the present invention corresponds to another example of the claim 7). It decides the different viewpoint scene data by referring to the reading effect table.

[0071]

In Figs. 12(a), 12(b) and 12(c), the horizontal axes represent the psychological state level K_t defined above and the vertical axes represent sound intensity (120), vibration intensity (121) and the number of blinks (122) respectively. The graph of FIG. 12(a) shows the relationship between the sound intensity and the psychological state level, the graph of FIG. 12(b) shows the relationship between the vibration intensity and the psychological state level and the graph of FIG. 12(c) shows the relationship between the number of blinks and the psychological state level. As seen in Fig. 12, each parameter takes a value in the range from zero to the maximum value.

[0072]

In Step S13, the reading effect control means acquires psychological information at the time t from the temperature sensor, humidity sensor and heart rate meter and stores the obtained values in the psychological information fields of the reading environment information area. In Step S14, the reading effect control means refers to the psychological information

field values and calculates the psychological state level. The reading effect control means seeks the sound intensity, the vibration intensity and the number of blinks on the respective graphs, which values correspond to the present psychological state level (Fig. 12). The reading effect control means further refers to the reading effect table to find the relationship between the reading effect and the parameters other than those used for control of the mental image data output. The reading effect control means determines, as described in claim 6, the method of outputting a different viewpoint scene data and the scene number and synthesizes the data with the prepared mental image data to generate the reading effect data. It is of course possible to prepare graphs of parameters other than those shown in Fig. 12(a) (sound intensity), 12(b)(vibration intensity) and 12(c)(the number of blinks).

[0073]

Fig. 13 is a flowchart depicting the procedure of outputting mental image data in proportion to the page turning motion (claim 8). Steps S11, S12 and S16 are the same as those described with reference to Fig. 7. Step S20 is a processing module for referring to the data fields of the mental image output identifier. Step S21 determines which of alternative processing paths to be followed depending to the obtained data being automatic or not. With the data value "automatic control", the reading effect control means locks the page turning function (Step S22). Then, the reading effect control means

performs Steps S13, S14 and S15 (in Step S23). On completion of outputting the reading effect data, the reading effect control means releases the page turning function from the locked state (Step S24) and advances the procedure to Step S16.

[0074]

With the obtained data value "not automatic control" in Step S21, the reading effect control means refers to detailed data of the mental image data identifier in the table and determines whether the value is the type that will be output in proportion to the page turning motion (Step S25) and decides which of alternative paths to be followed. If the value was not motion proportional, the reading effect control means waits until the user clicks a reading effect mark (Step S26). When the reading effect mark was clicked, the reading effect control means performs the processing of Step S27.

[0075]

With the obtained value being the motion proportional type is Step S25, the reading effect control means starts tracing the page turning motion (traveling cursor) (Step S27). In Step S28, the motion is calculated as follows.

[0076]

Different from the psychological state level K_t of Fig. 7, this embodiment uses psychological state levels K_m to be defined according to the following equation.

$$K_m = \beta U$$

where β is a proportional constant and u is a motion value.

When a cursor is assumed to move linearly from a starting point of a screen image (Fig. 8) to a starting point of an area to which a mental image data is related, a value U can be approximated a value proportional to a distance r between the above two points. Consequently, the psychological state level k_m can be expressed as

$$K_m = \gamma r \quad (\gamma \text{ is a proportional constant})$$

and the output level of the mental image outputting means, which is proportional to the motion, can be determined by using the related graphs of Fig. 12.

[0077]

The above output is continued until the cursor arrives at a reading effect mark (Step S29). After that, the output level is kept at the same as the cursor arrives during cursor exist on the reading effect mark until the cursor is off the mark (Step S30). In the above case, the output of the mental image output means can be increased in accord with the motion of user's hand or fingers, giving an increased impressive effect.

[0078]

Figures 14(a) and 14(b) show timing charts each for outputting reading effect data on a display screen image with two reading effect marks put at different places thereof. Fig. 14(a) depicts the case where respective reading effect data outputs have no overlaps in time. Fig. 14(b) depicts the case where respective reading effect data outputs have overlaps in time. In Figs. 14(a) and 14(b), T_{s1} and T_{s2} are the times

determined by the time switching mode and a duration value $(Te1-Ts1)$ or $(Te2-Ts2)$ is determined by the times set by the display mode. If the outputs have the overlap $(Ts2-Te1)$ as shown in Fig. 14(b), respective output levels are overlapped, averaged and output.

[0079]

It is possible to adjust the output level to any of values from zero to the infinity when producing each reading effect data or reading psychological data information. This shows claim 10 is obvious.

[0080]

Fig. 15 shows an example of a menu screen for setting parameters (claim 11). The menu is called up on the screen by using a newly provided button or by simultaneously pressing two or more cursor direction keys. Selection of each item in the menu is made by using the cursor. Application examples of the present invention will be described below for each application purpose. The purpose item shown on the top line in the menu may have a special independent button provided on the electronic book displaying device.

[0081]

(Embodiment 1)

This aspect of the present invention relates to application of the electronic book displaying device as a quick reading device. To realize the quick reading, several areas for easily transmitting the content of the displayed book data in a short

time or areas for simply indicating a summary of the displayed content are extracted from the book and stored as respective areas. For each of the extracted areas, the waiting time is adjusted in the time switching mode in view of its display order and the display time length allowing the user to understand the scene is preset in the display mode. The areas prepared for quick reading are subsequently displayed on the display screen in the respectively preset waiting times and sequence for the respectively preset time, thus realizing the quick reading aiding function. Quick-reading devices of different quick reading levels can be realized by combining the display waiting time, display time and the areas to be displayed for quick reading. Quick-reading devices of different quick-reading levels can be realized by combining the display waiting time, display time and different viewpoint scene data.

[0082]

(Embodiment 2)

This aspect relates to application of the electronic book displaying device as a learning and/or quiz play device. For example, a page of questions (tests) or quizzes is displayed as book data. The time for which the user has to answer to each question is set as the waiting time in the time switching mode. The correct answer to that question is displayed as a different viewpoint scene data. This is shown in Fig. 16. The tension of suspense can be provided by switching the screen image to another by the limit of time.

[0083]

(Embodiment 3)

This aspect relates to application of the electronic book displaying device as a simple animation player. An area to which different viewpoint scene data is added is of the same size as a page size of the book data and a reading effect mark is applied to a whole screen. The different viewpoint scene data included in a page of the book data is one screen. The display time 101 of different viewpoint scene data is set to the time enabling the user to read the displayed data content in the display mode 48. After the display time preset in the display mode 48, a code value 0x01 is selected in the after time processing field 102 and applied to the next page of the book data. The same different viewpoint scene data is set to all pages, whereby pages are automatically turned to create a simple animation based on the principle of an animated cartoon. The automatic page turning device can be also realized by the same method.

[0084]

(Embodiment 4)

This aspect of the present invention relates to application of the electronic book displaying device as a device for improving the latent power of the user and/or psychological treatment. Prior to the description of the method to realize the device, a subliminal image is briefly described below. A TV scene that we usually see is a sequence of 30 (picture) frames

per 1 second. If a picture frame having a period shorter than the above time is mixed in the normal picture frames, it is invisible to viewer's eyes. However, it is known that the frequently insertion of such invisible image can produce a psychological effect to the viewers. Inserted for the shorter period is called a subliminal image. In this application, different viewpoint scene data has the longer waiting time in the time switching mode and the display time of less than 30 milliseconds. After the display time elapsed, the different viewpoint scene data is replaced by the preceding normal scene. When the different viewpoint scene data being a message, e.g., "Your capacity is developing" or "You will success in examination for the objective university" or "Your soul is saved" is displayed frequently under the above display conditions, it may have the subliminal effect.

[0085]

(Embodiment 5)

This aspect of the present invention relates to application of the electronic book displaying device as a device for cultivation of aesthetic sentiments and/or relaxation purpose. This can be realized by preparing different viewpoint scene data or metal image data whose content is suitable for the above purpose. The display time of the data is set to relatively long time, e.g., 5 minutes or more to increase the effect of the presentation.

[0086]

(Embodiment 6)

This aspect of the present invention relates to application of the electronic book displaying device as a device capable of presenting a new book. This can be realized by making an increment of the scene number of the different viewpoint scene data as the number of reading times increases, using the reading history information.

[0087]

(Embodiment 7)

This aspect of the present invention relates to application of the electronic book displaying device as an automatic comic reading device or a presentation display device. This is another embodiment relative to the embodiment (3). This embodiment can be also applied for books having pages each divided into plural areas to be read in the predetermined order. Referring to Figs. 17(a), 17(b), 17(c) and 17(d), the application is described below.

[0088]

Fig. 17(a) shows a particular image divided into three areas 1 (scene 1), 2 (scene 2) and 3 (scene 3) to be read in the described order. The next page has areas 1 (scene 4), 2 (scene 5) and 3 (scene 6).

[0089]

Fig. 17(b) shows an exemplary structure of book data, wherein different viewpoint scene data or mental image data is prepared for n-scenes (n is the scene number) for respective

areas of book data of page 1. Book data of the next page 2 and subsequent pages have only book data and a reading effect mark is applied to a whole of each area.

[0090]

Fig. 17(c) shows a timing chart for display (scenes) to be displayed on the display means. Areas 1, 2, 3 of Page 1 are displayed for example at the time p0, and exchanged by different viewpoint scene data at the times p1, p2, p3 respectively. The different viewpoint scene are changed to alternative different viewpoint scene at the times p4, p5, p6 respectively.

[0091]

Fig. 17(d) shows the content of a reading effect table in which the area numbers are stored in horizontal axis and the scene of image changes in each area in the vertical axis. In each cross cell, there is stored a scene number of different viewpoint scene data (the page number and the area number are the same that the page number and the area number of the book data unless otherwise specified).

[0092]

The operation of the reading effect means will be described about how to image changes, omitting the processing of mental image data for the simplicity of the explanation.

[0093]

First, the user operates the page turning means of the device to display a book data of page 1 on the display screen. The reading effect control means recognizes the presence of

three reading effect marks on the screen image consisting of mental image data 1 for area 1 of page 1, mental image data 1 for area 2 of page 1 and mental image data 1 for area 3 of page 1. The reading effect control means reads reading environment information and recognizes that the purpose code value means "automatic reading comics".

[0094]

The reading effect control means then refers to a reading effect table (Fig. 17(d)) for automatic reading comics. Since the scene changing is conducted first time and the reading effect mark is added to area 1, different image scene 1 is selected. Referring to the data format shown in Fig. 4, the reading effect control means makes preparation for changing the display scene to a different viewpoint scene data 1 (for area 1 of page 1) designated in the reading effect table after the time (p1-p0) determined in the time switching mode.

[0095]

Referring to display mode information in the data format (Fig. 4), the reading effect control means continues the data display for the time (p4-p1) from the time p1 and does preparation for continuing the same display after the time (p4-p1). Next, the reading effect control means combines mental image data 1 obtained from the mental image data 1 of the page area 1 with the different viewpoint scene data 1 for area 1 of page 1. In this example, the mental image data processing is omitted and, therefore, the scene of book data area 1 of

page 1 is changed to the different viewpoint scene data 1 for area 1 of page 1 at the timing specified in the time switching mode and the latter image is displayed for time preset in the display mode (the display is continued after the specified time elapses. A value of a buffer for managing the number of scene changes is increased by 1 (i.e., the initial set 1 is incremented to 2). The similar processing operations are made for the areas 1 and 2.

[0096]

The processing for scene 4 in area 1 of the screen image is described below. It is now assumed that the reading effect mark obtained from mental image data 2 in area 1 of page 1 exists in the same area (i.e., a whole area of scene 1 of Fig. 17(a)) in which mental image data 1 of area 1 of page 1 was displayed, and the values obtained from the time switching mode and the display mode for different viewpoint scene data 1 for area 1 of page 1 are equal to the corresponding values of the book data. In this instance, the scene of area 1 is changed to the different viewpoint scene data 2 for area 1 of page 1 when the time (p4-p1) elapsed from the time p1 and displayed for the period (p7-p4). The automatic comic reading device having an output shown in Fig. 17(c) can be realized by repeating the similar processing for other areas.

[0097]

In Fig. 17(b), mental image data n of area 3 of page 1 is followed by book data of page 2 and subsequent pages. This

arrangement allows the user to read electronic comic story books avoiding continuous reading comics. Image data of the book data has the structure common to the different viewpoint scene data.

[0098]

(Embodiment 8)

This aspect of the present invention relates to application of the electronic book displaying device as a usual electronic book reading device that can be realized by omitting all input and output for the reading effect.

[0099]

[Effect of the Invention]

The present invention, as described above, can output reading effect data that is multimedia information including different viewpoint scene data, voice and sound data and vibration data. This can create a vivid and real impression enabling the reader to further enjoying the reading of the book.

[0100]

The embodiment is provided with the reading managing means for capturing a psychological state of the reader and can output increasing the reading effect suitable to the reader's psychological state.

[0101]

It is possible to automatically select different viewpoint scene data and mental image data, which are best suited to the reader's purpose, personality, psychological state and

reading history contained in the reading management information. This results in considerably lessening labor for preparing the reading effect data.

[0102]

The reading environment information including reader's history enables the reader to read the same book with a new fresh feeling by varying the content of the book data in accord with the number of times of reading.

[0103]

The reading speed can be controlled in accord with the user's reading environment information and/or the content of the book. For example, the embodiment can provide a quick-reading function and a slow reading function.

[0104]

By selecting display switching time, reading display mode information and different viewpoint scene data, subliminal image data and voice and sound information, which are reproduced for very short time as compared with that of book data, can be mixed in the book data by selecting display switching time, reading display mode information and different viewpoint scene data. This function may increase the reading effect, develop the latent power of the user and improve the psychological treatment effect and educational effect of reading.

[0105]

The book data of the same page can be changed depending upon

the date and time by using the reading environment information. This may help the user in understanding the reading.

[0106]

Output levels of vibration and voice and sound data, which are related to the book data, can be changed widely by using the display mode information. For example, the output is varied gradually to create fading in or fading out effect for emphasizing the reading effect.

[0107]

The output level of mental image data can be changed depending upon the motion amount of the page turning operation, further increasing the environmental effect and reading effect.

[0108]

The output levels of vibration data and voice and sound data, which data related to plural units of book data and coexist in the same page or the same window, can be controlled by an output level control function. For example, plural sound signals are fused into a single output signal having the increased effect.

[0109]

The integration of the above functions of the embodiment realizes an electronic book displaying device which has means for capturing and managing reading environment information including user's psychological state and reading state and, when displaying the book data to which the reading effect data,

can easily output the multimedia reading effect data adapted to the user's reading environment information. The electronic book displaying device according to the embodiment of the present invention can thus increase the reading effect and psychological and educational effects of reading.

[Brief Description of the Drawings]

Figure 1 is a block diagram of an electronic book displaying device according to an aspect of the present invention.

Figure 2 illustrates an external view of a typical electronic book displaying device according to an aspect of the present invention.

Figures 3(a) and (b) are schematic views showing formats of an electronic book data recorded on a storage means.

Figure 4 illustrates an exemplary data format of one page of book data.

Figure 5 illustrates an exemplary data format of mental image data to be output in accord with a book data content, which is included in the book data stored on the storage medium.

Figure 6 shows an exemplary data structure of reader's environmental information to be managed by a environment control means.

Figure 7 is a flowchart depicting an exemplary data processing by a reading effect control means according to the present invention.

Figure 8 shows an exemplary image of a specified page displayed on a display means.

Figure 9 is a view for explaining an exemplary time switching mode for defining timing of outputting a reading effect data at Step S15 of the flowchart (claim 4).

Figure 10 shows an exemplary structure of a data to be displayed in a display mode.

Figure 11 shows an exemplary reading effect table used for establishing a correlation between reader's environmental information and reading effect data to be output.

Figures 12(a), (b) and (c) are views for explaining an electronic book displaying device according to another aspect of the present invention (claim 7).

Figure 13 is a view for explaining an electronic book displaying device according to another aspect of the present invention (claim 8).

Figures 14(a) and (b) are views for explaining an electronic book displaying device according to another aspect of the present invention (claim 9), which uses shown timing charts of outputting reading effect data for respective reading effect marks existing at two places on a display screen.

Figure 15 is a view for explaining an exemplary menu image for inputting settings (claim 11).

Figure 16 is a view for explaining an electronic book displaying device according to another aspect of the present invention, which is used as a display unit for learning audiovisual material or enjoying a quiz game.

Figures 17(a), (b), (c) and (d) are views for explaining

an electronic book displaying device according to another aspect of the present invention, which is used as a display unit for automatically displaying scenes in a comic or a presentation display unit.

[Explanations of Letters and Numerals]

- 1 Storage Means
- 2 Display Means
- 3 Page Turning Means
- 4 Environment Managing Means
- 5 Second Storage Means
- 6 Mental Image Output Means
- 7 Reading Effect Control Means

FIG.1

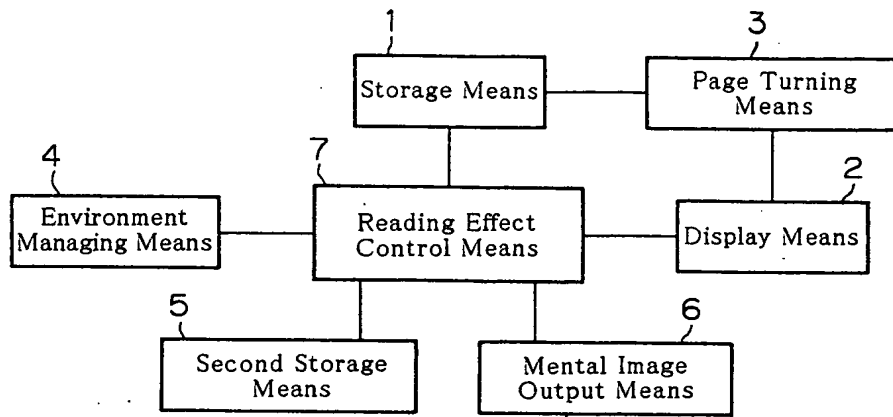


FIG.2

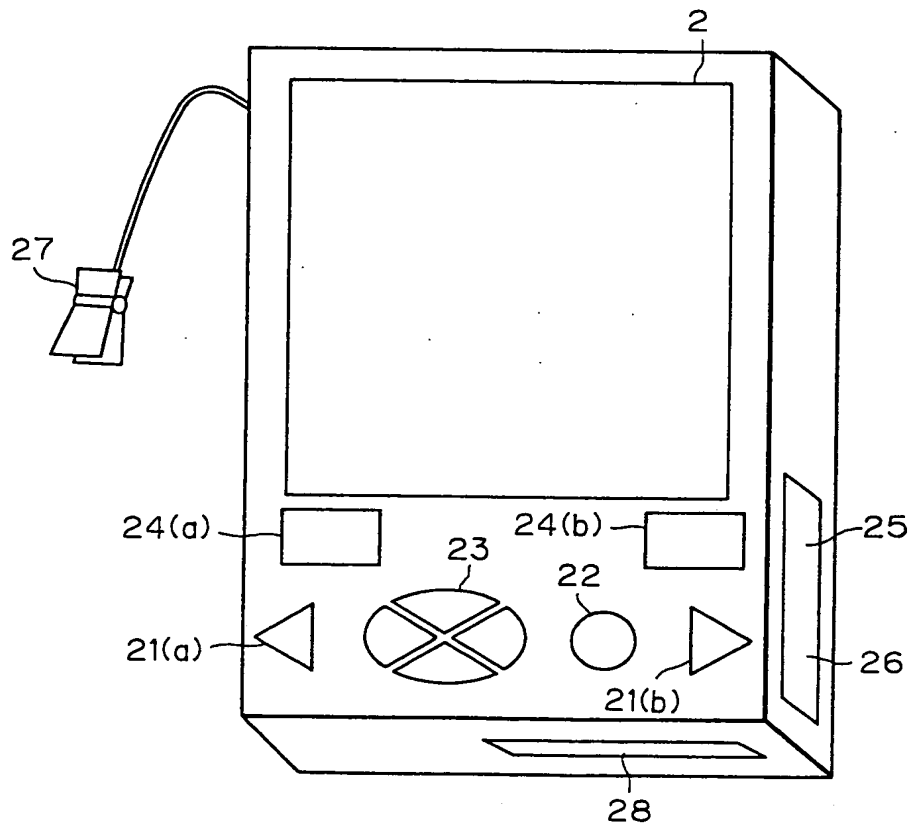
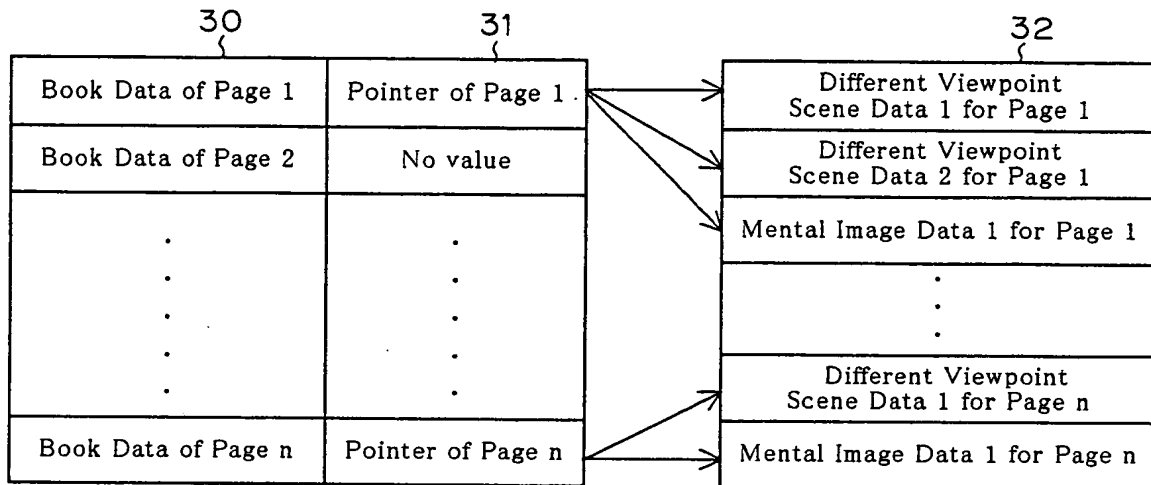


FIG.3

(a)



(b)

33
Book Data of Page 1
Different Viewpoint Scene Data 1 for Page 1
Different Viewpoint Scene Data 2 for Page 1
Mental Image Data 1 for Page 1
Book Data for Page 2
...
Book Data for Page n
Different Viewpoint Scene Data 1 for Page n
Mental Scene Data 1 for Page n

FIG.4

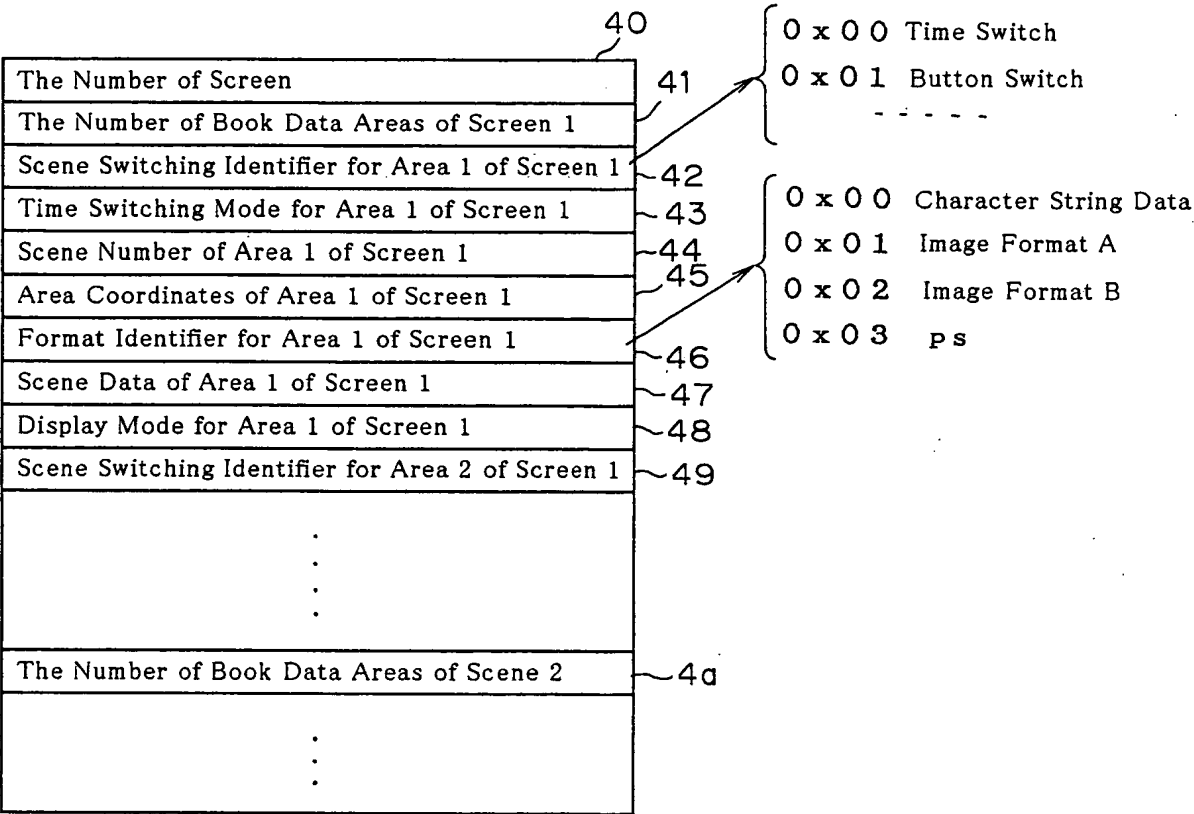


FIG.5

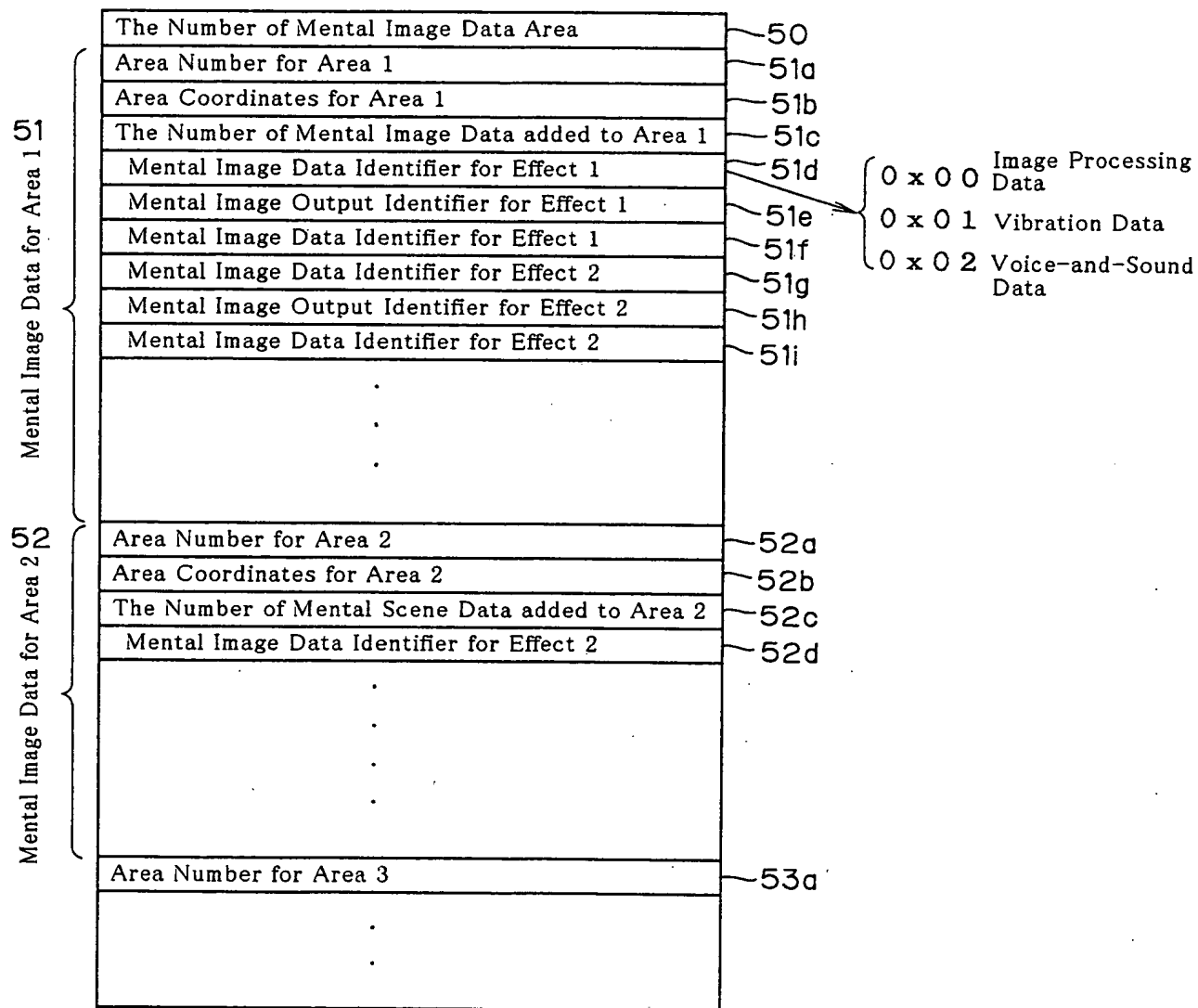


FIG.6

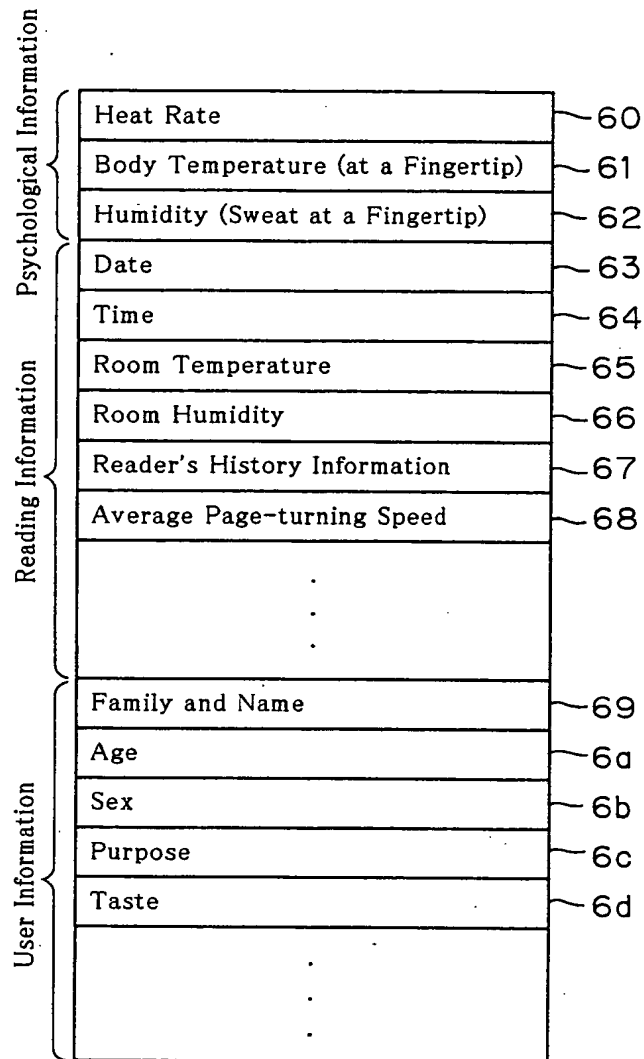


FIG.7

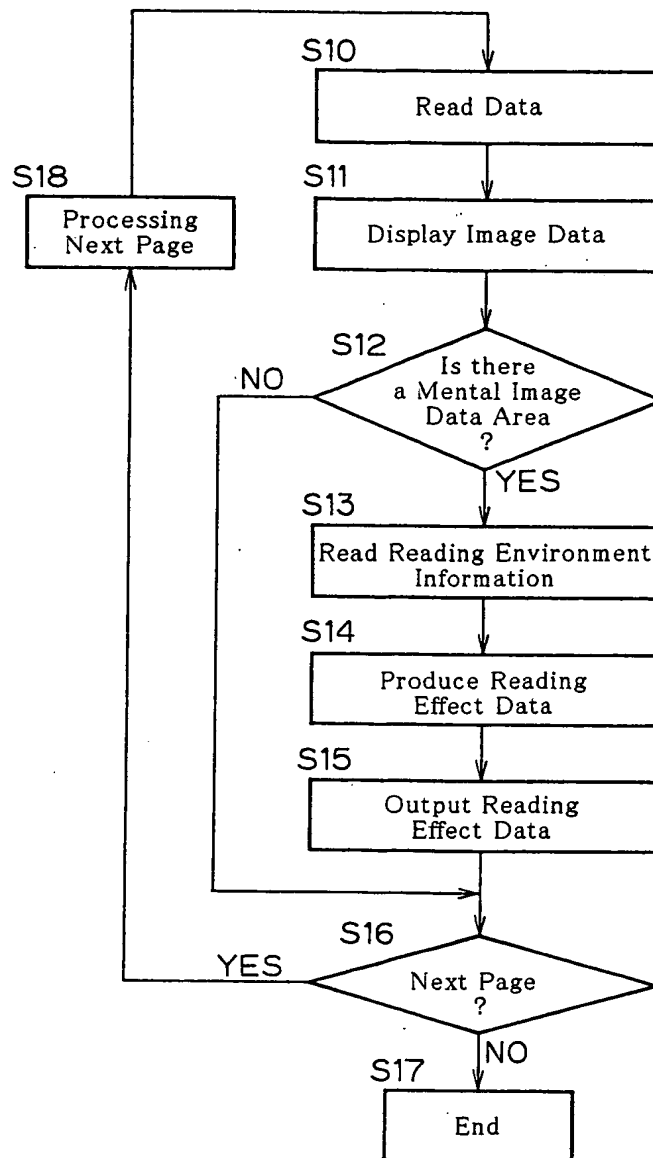


FIG.8

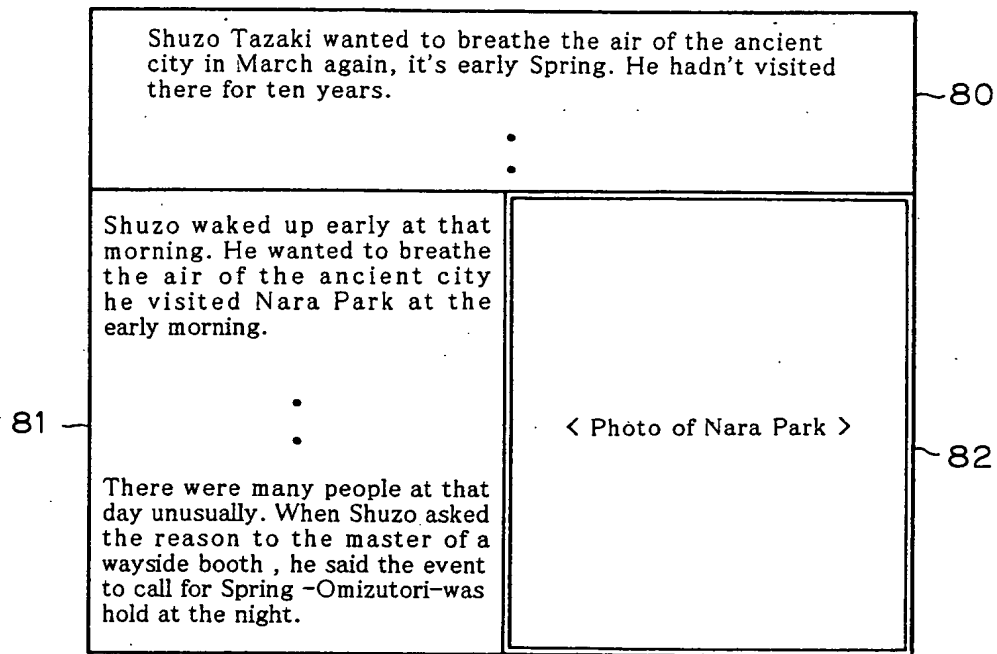


FIG.9

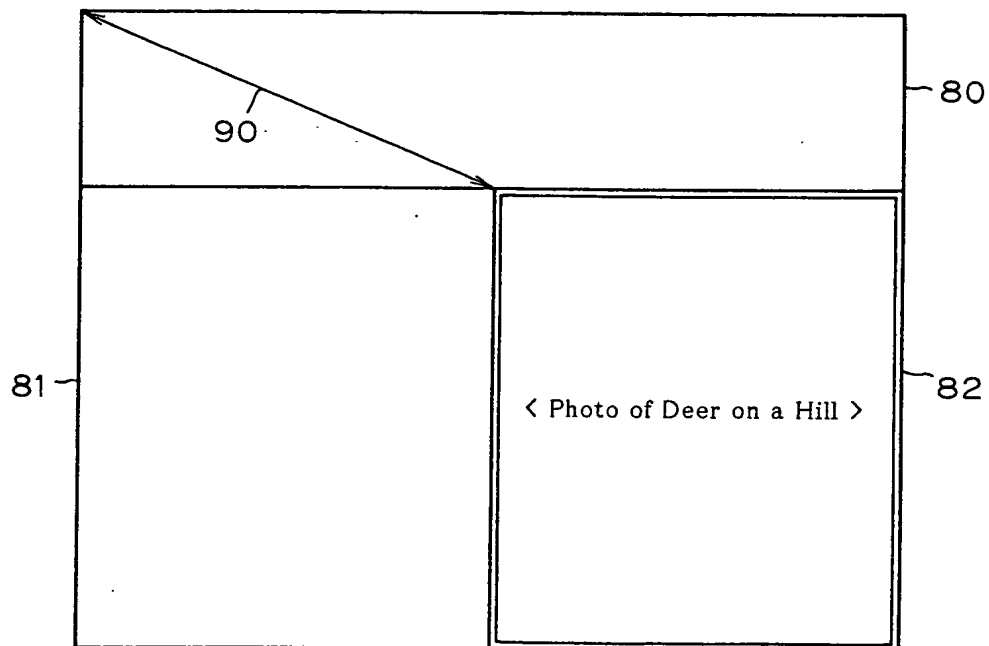


FIG.10

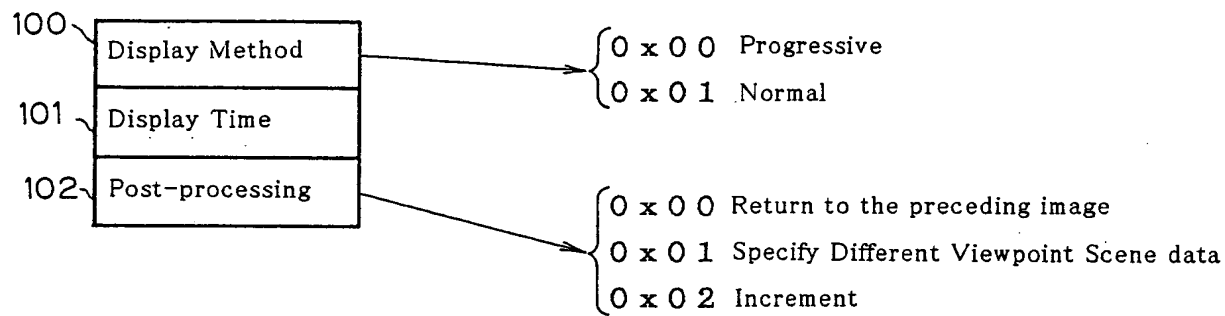


FIG.11

		Heart Rate		
		Range 6a1	Range 6a2	- - - - -
Sweating	Range 6b1	Data 6d11	Data 6d12	- - - - -
	Range 6b2	Data 6d21	Data 6d22	- - - - -
	.	.	.	
	.	.	.	

FIG.12

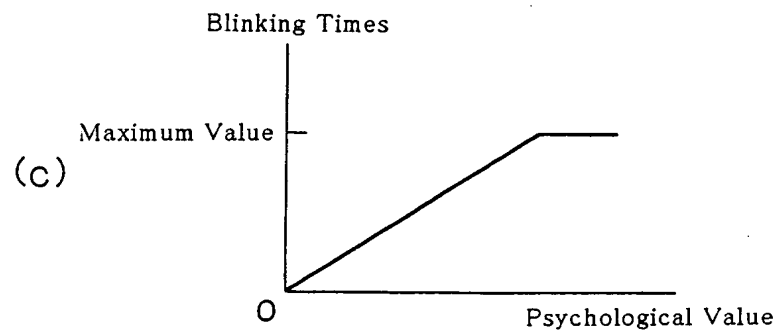
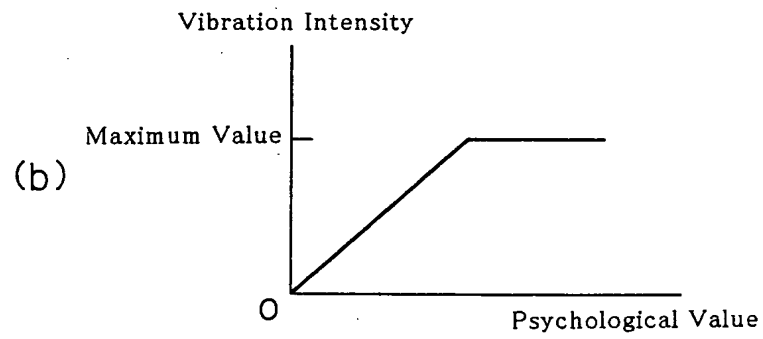
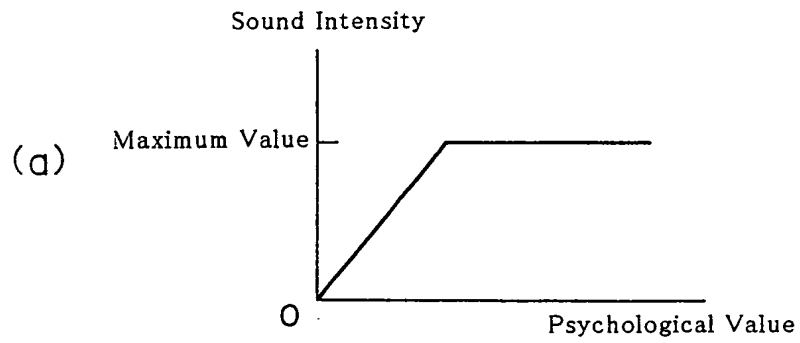


FIG.13

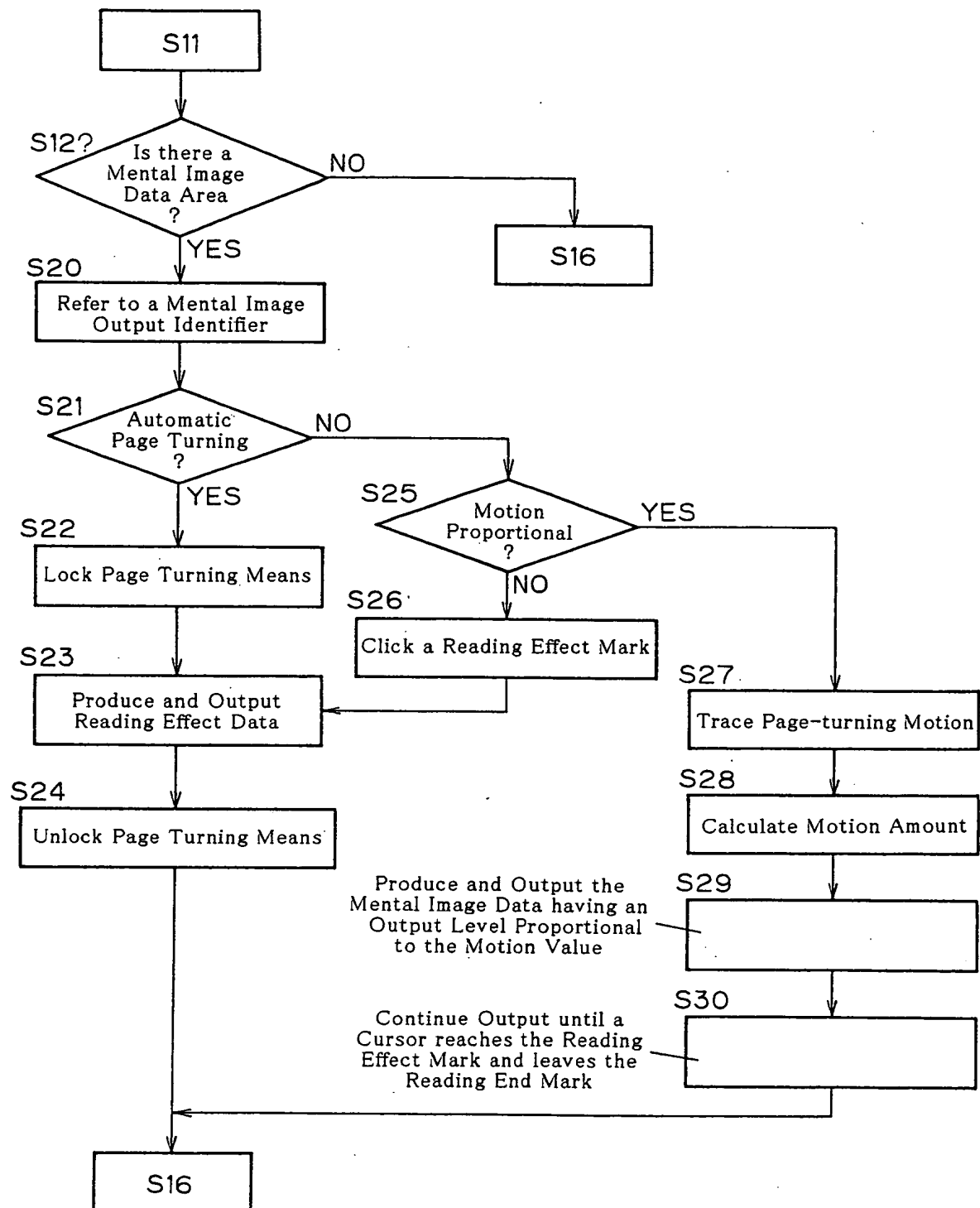
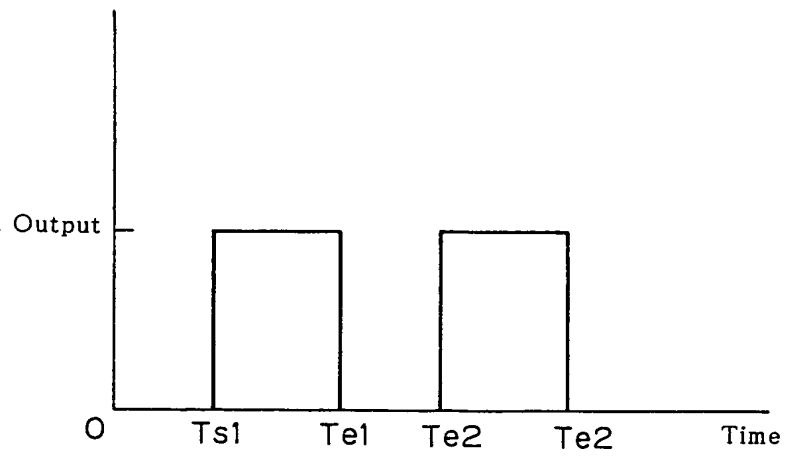


FIG.14

(a)



(b)

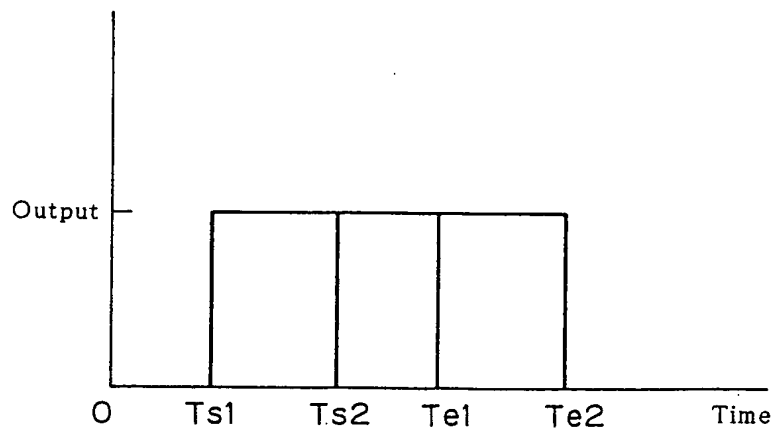


FIG.15

Menu (n) for setting Reading Effect Parameter Values

Purpose | Quick Reading Latent Power Cultivation of Artistic Sentiments
Learning

Family and Name _____

Age _____

Sex _____

Taste Classical Music Pops Light Color Showiness Coolness

➡

※ Values in rectangles have been selected.

FIG.16

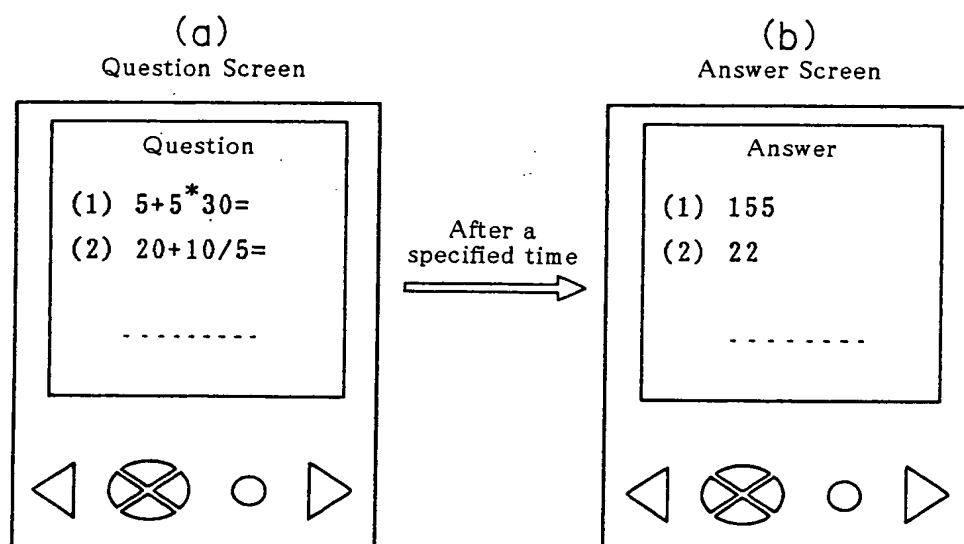
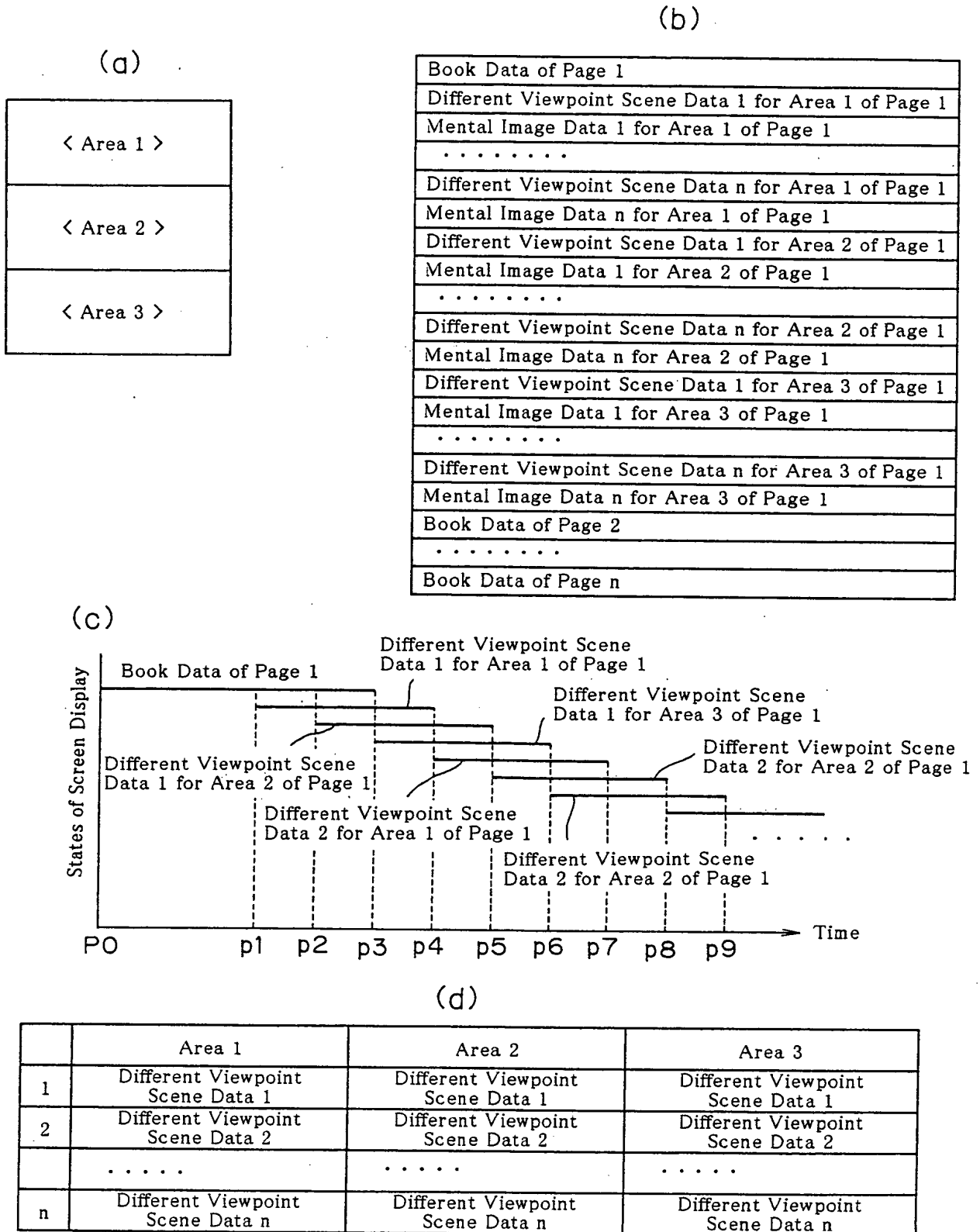


FIG.17



[Document Name] Abstract

[Abstract]

[Object]

To realize an electric book display to easily output multimedia read effect data suited to a psychological state at reading, reading environment, purpose, etc., of a user and to promote presence which is not experienced by an ordinary book, not only the reading effect but psychological and educational effects.

[Solving Means]

The electronic book display is provided with a storage means in which book data is stored, a display means to display the recorded book data, a page turn means to turn over a page of the book data displayed on the display means, an environment managing means to manage read environment information of the user, a second storage means to store different viewpoint scene data in which the book data of the displayed page is expressed in another viewpoint or mental image data to emphasize the image of the different viewpoint scene data, a mental image output means to output the mental image data and a read effect control means to output the read effect data generated by using the different viewpoint scene data and the mental image data.

[Selected Drawing] Fig. 1